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Qualitative Urine Analysis in the Dog and its Clinical Significance*

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The subject of to-day's discussion presents an absorbing and important aspect of everyday practice. Some of you have been obliged to listen to my discourse on urine analysis before, and if my enthusiasm is pressing you will, I hope, realise that it is only to gain more information and experience from you that I have once again broached the subject. It has, of course, been dealt with on previous occasions by different authors and under varying titles, and any repetition in this paper will, it is hoped, be overlooked.

The diseases of the urinary system in the dog present many interesting conditions, with nephritis, varying in its aetiology, symptoms and treatment, at the head of the list. In this paper, a more open title has been chosen in order to get away from the subject of nephritis alone, and to approach the problem from the viewpoint of analysis and of differential diagnosis.

It is essential to emphasise that the clinician himself should carry out a systematic urine analysis, and should not, having made a clinical examination and ascertained the previous history of the patient, take the short and easy path of testing for a suspected constituent only. The request for a urine sample sometimes causes unnecessary amusement or disgust on the part of the owner, but in such cases, which fortunately are not very frequent, a sensible outlook can usually be encouraged by discussing the importance of the sample to differential diagnosis and to prognosis.

Certain elementary precautions are necessary in taking a specimen, which should be collected and stored in clean containers, having been obtained whenever possible directly from the patient. Specimens taken from the floor, matting or ground are liable to be contaminated. The volume of the sample should be ample to carry out all the usual tests, and about 2 oz. is usually sufficient. Analyses should be carried out at the earliest opportunity after receiving the specimen, as on standing the reaction may alter. Before testing for the various chemical constituents it is advisable to filter the urine, especially if it is cloudy or contains solid matter. Contamination with semen, vaginal secretions, or with faecal matter may give rise to false protein reactions, and such contamination should be ruled out by microscopical examination.

The routine qualitative tests are well known, and were demonstrated at the 1934 N.V.M.A. Congress by Professor Boddie (see Boddie, 1935). It is most important not to rely upon a single test only, and whenever possible, once a diagnosis has been made, specimens should be taken at regular intervals.

All the data presented and discussed in this paper are based upon qualitative analysis only, as general practice does not allow either the time or the facilities for quantitative estimations. The following will be dealt with under separate sub-headings: (1) Colour; (2) reaction; (3) specific gravity; (4) "albumin"; (5) bile: (*a*) pigment; (*b*) salts; (6) "sugar"; (7) deposit; and (8) additional tests—ketone bodies, indican, haemoglobin, etc. Certain authors (*e.g.*, Harrison, 1937) recommend a definite routine of analysis, but such methods based on human urology are not necessarily the most expeditious in the case of canine samples.

(1) Colour

This should be noted and compared with the standard of normal, described as "pale yellow" or "straw yellow." Colour varies according to concentration and to the amount of pigment present and, particularly when taken in conjunction with the specific gravity, may be of valuable clinical significance. The usual variations noted are:—

(i) *Pale watery*—as in chronic nephritis, in certain nervous conditions, in some cases of anaemia, in the late stages of diabetes mellitus, and in cardiac diseases.

(ii) *Light yellow*—as in diabetes mellitus.

(iii) *Highly coloured*—as in the concentrated urine of febrile conditions, hepatic disorders and pancreatic diseases.

(iv) *Reddish brown*—as in haemorrhages of the genito-urinary tract.

(2) Reaction

In the dog (as in the cat and other carnivores) the reaction is normally *acid*, and this is usually unchanged in nephritis, prostatitis nephrolithiasis, obstructive urethritis and vaginitis. In cystitis, the reaction is nearly always strongly *alkaline*. Occasionally I have noted "*amphoteric*" reactions, in some cases of nephritis and pyelitis, and also in normal specimens. Reaction is a useful guide, and should be determined routinely.

(3) Specific Gravity

This is the gauge of the concentrating and diluting capacity of the kidney, and depends upon the concentration of solids in solution. The formation of urine consists of glomerular filtration followed by selective tubular resorption. Such substances as are necessary for restoration of the composition of the blood are resorbed (threshold bodies), whereas substances not required by the blood (non-threshold bodies) and threshold bodies which were present in excess in the plasma are excreted in the urine (see Dukes, 1935, p. 325). When the concentrating power of the kidney is impaired, there is a compensating polyuria, and the urine passed is of lowered specific gravity. (It is usually possible to ascertain that the dog is passing greater quantities of urine than normal by observation: even in hospitalised animals it is rarely practicable to obtain 24-hour samples. See Worden, 1939.)

The specific gravity of urine is usually expressed as a four-figure number, *e.g.*, 1025 rather than 1·025. If the available quantity of urine for a direct urinometric determination is too small, the sample may be diluted with one, two or three times its volume of water and multiplying the last two figures of the observed reading by the number of dilutions, *e.g.*, urine diluted twice—observed reading = 1010; specific gravity = 1020.

A *high specific gravity* has been encountered in cases of acute nephritis, prostatitis (especially acute prostatitis), diabetes mellitus, acute liver disorders, primary or secondary degeneration of the liver (with accompanying bile-pigment excretion), and in certain cases of albuminuria of non-renal origin, *e.g.*, in some cases where there are cerebral disturbances.

A *low specific gravity* has been noted in chronic nephritis (where it has actually fallen to 1000), and in cardiac cases and certain nervous cases of undetermined origin. (Volhard, 1935, discussing renal insufficiency in man, points out that the end-result of failure to concentrate the urine is a state of isosthenuria, in which equal amounts of urine of equal specific gravity are passed during the night as well as during the day. The total concentration of this urine is the same as that of deproteinated blood, and corresponds to the specific gravity of 1010.)

It is noteworthy that in diabetes mellitus, despite the polyuria, there is a raised specific gravity. This is in marked contrast to the urine excreted by chronic nephritics, in which there is a polyuria but a lowered specific gravity.

(4) "Albumin"

Strictly speaking, one should speak of proteinuria, but the term "albuminuria" is well established clinically, and is often used to denote not only the presence of albumin or globulin in the urine, but also that of mucus. "Albuminuria," even when restricted to the passage of blood-protein into the urine, may embrace (*a*) physiological proteinuria, which is transient, or (*b*) pathological proteinuria, *i.e.*, persistent or essential.

(*a*) *Physiological proteinuria.* This type, which occasionally occurs in the urines of healthy animals, is of no clinical significance but should be kept in mind as being distinct from type (*b*). It has been reported in (i) fatigued animals; (ii) in those receiving a diet containing excessive amounts of protein; and (iii) in those exposed to intense cold.

(*b*) *Pathological proteinuria.* From the analytical point of view, "albuminuria" is the most prominent sign of renal disease *but* it is now recognised that it may occur in many conditions without the existence of serious organic change in the kidney. In cases of albuminuria, therefore, microscopical examination of the urine should be carried out, and should be correlated with clinical symptoms

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in order to ascertain the probable origin of the protein and to make a definite diagnosis of renal disease or otherwise.

Pathological proteinuria will therefore be seen to present a big and interesting aspect of urine analysis. Clinically, it is helpful to divide it into (i) proteinuria with definite primary lesions in the urinary organs, and (ii) proteinuria as it occurs in other diseases.

(i) *Proteinuria with primary lesions in the urinary system.* This is met with in :—

Diseases of the kidney—all stages of nephritis ; neoplasia ; nephrolithiasis.

Diseases of the ureters, bladder, urethra and prostate (which for convenience may be regarded as one of this group of organs). In such cases, of course, the protein may arise from the damaged tissues of the tract.

(ii) *Proteinuria as it occurs in other diseases.* This may occur in such other conditions as :—

Chemical poisonings, *e.g.*, mercury, lead, arsenic, lysol and, as noted during recent years, sulphonamides.

Fevers—the so-called "febrile albuminuria," *e.g.*, in many early cases of distemper, notably the fluctuating type with temperature between 102 and 103° F., and with sufficient proteinuria to give a "+" or "±" reaction, using the sulphosalicylic acid test.

Diabetes mellitus, in which the kidney may present cloudy swelling ; proteinuria, which is common, imitates the glycosuria and starts to diminish when sugar excretion is on the decline.

Diseases of the liver, *e.g.*, many cases of jaundice.

Cardiac diseases, as well demonstrated in old Pekingese dogs with mitral endocarditis.

Diseases of the nervous system, *e.g.*, haemorrhages, meningitis, and fits of unknown origin.

Toxaemia of pregnancy.

Toxaemia resulting from bad teeth, absorption from wounds, etc.

Metritis and vaginitis, in which the protein usually arises from pus and is really a urinary contaminant.

From this somewhat extensive list, it will be seen that we are now in a different sphere of disease, where toxins or altered conditions of the nervous, circulatory or digestive systems play the primary role, and the kidney is of secondary importance. In such conditions, however, the kidney usually shows a degenerative process, *i.e.*, a nephrosis. In the past, the word "nephritis" has been loosely used by clinicians to designate both inflammatory and degenerative conditions. Many cases so designated have been shown, with time, development of symptoms, and treatment, to belong to the nephrosis group. This is my own clinical assumption, and I must apologise for lack of proof, due to the small number of *post-mortem* examinations which it has been possible to carry out. Further histological examinations are necessary in order to support the contention. It must be emphasised, however, that proteinuria in these cases which I have chosen to consider as "the nephrosis group" is always much more profuse, gives a quick and more characteristic precipitation with sulphosalicylic acid, and clears up correspondingly quickly. On clinical grounds, at any rate, I feel the distinction to be a great help in prognosis, and it also implies some modification of treatment.

Another pressing problem which may be mentioned here is that of secondary infection of the kidney with β-haemolytic streptococci from the tonsils and pharynx. In such cases, laboratory assistance is essential, and bacteriological examinations should be carried out after clinical observation has indicated the possibility of the condition.

(5) Bile Pigment and Bile Salts

These tests should be carried out routinely, whether or not liver disease is suspected clinically. (It is unfortunate that, apart from these tests, there is no simple clinical assay for liver damage suitable for use in general veterinary practice. The easily carried out and apparently very valuable cephalin-cholesterol flocculation test, devised by Hanger, is not applicable to dog or cat sera. Hanger, 1938.)

Bile pigment. This may be found in (*a*) diseases of the liver, *e.g.*, obstructive and haemolytic jaundice, phosphorus poisoning, degenerative conditions and neoplasia ; (*b*) other conditions, *e.g.*, stasis of the bowel, diseases of the pancreas, some cases of nephritis, and occasional cases of cardiac disease.

Bile salts. These are rarely excreted in the urine of dogs, and their presence is generally of serious significance. They have been found to be excreted in neoplasia of the liver and in haemolytic jaundice.

(6) "Sugar"

The tests normally employed for "sugar" are not specific, and strictly speaking, one should record positive reactions as indicating the presence of reducing substances. In certain circumstances, other substances may give slight positive reactions with Fehling's and other cupric solutions, *e.g.*, salicyluric acid following the administration of salicylates, and creatinine and uric acid in concentrated human urines are also reported to give positive reduction tests. (Uric acid is, of course, excreted in very small quantities only in canine urine, except as noted below). It may be desirable, therefore, to get biochemical confirmation of the presence of glucose when a positive test is obtained.

Glycosuria in the dog is rare. Temporary "alimentary" glycosuria has been observed following large intake of carbohydrate (Boddie, 1935). True diabetes mellitus does occur naturally, and in such cases frequent and complete analysis is essential. Diabetic urine tends to froth easily on shaking.

(7) Deposit

It is important to examine the deposit from a fresh specimen, as cells and casts deteriorate rather quickly, particularly in hot weather. Better results are obtained if the urine is centrifuged, but the old method of sedimentation (allowing to stand for 2 to 4 hours) can often yield useful information.

The following lenses are used :—

Objective	Eye-piece	Magnification
2/3	10	90
1/6	10	420
1/12	10	960

Microscopical examination plays a very important part in urine analysis, and should be carried out wherever possible in order to determine the various types of cells, *e,g.*, red blood corpuscles, leucocytes, pus cells, epithelial cells and "casts." The epithelial cells encountered are those of the lining of the genito-urinary tract, while the casts usually encountered are granular, hyaline or mucoid.

Various types of crystalline deposit are sometimes encountered, and may if desirable be examined as noted under (8).

(8) Additional Tests

In addition to the foregoing, which have been found adequate in everyday practice, a few other tests are occasionally employed, usually as a degree of differentiation. Such tests include reactions for :—

(*a*) *Ketone bodies*, which are rarely found in the dog, with its resistance to ketosis, but arise from faulty fat metabolism in diabetes mellitus.

(*b*) *Indican*, an end product of intestinal putrefaction of nitrogenous substances, excreted in cases of alimentary stasis but not of much significance.

(*c*) *Haemoglobin*, excreted in haemoglobinuria and "haematuria." (If a spectroscope is used for this test, any abnormal bands should be noted and if possible further investigated. Thus, although clinical cases of porphyruria or myoglobinuria have seldom or never been reported in dogs, such conditions could be suspected on careful spectroscopic examination of the urine, which would probably be sufficiently altered in colour to indicate the presence of abnormal pigments.)

(*d*) *Tests on various deposits.* Simple qualitative tests for determining the chemical nature of urinary calculi in the dog have recently been described by White (1944). Some of these tests are applicable to urinary deposits and, of course, to small calculi passed in the urine. The murexide test for uric acid is one which may be used to advantage. The majority of dogs do not pass significant quantities of uric acid in the urine, but there is an inherited recessive factor for "high uric acid excretion" (Trimble and Keeler, 1938) usually manifested in the Dalmatian breed. Sudden excretion of uric acid or urate does, however, occasionally occur in dogs of other breeds, the material precipitating out rapidly on standing. Such an occurrence has been known to follow injury, although the association may have been fortuitous. Urate stones are not confined to Dalmatians.

. . . . .

The degree of information derived from frequent tests can be estimated from Table I, which shows how the analytical picture alters as the patient progresses. A summary of one series of cases in which urology has proved of inestimable value is shown in Table V.

Table Ia.—Acute Nephritis
Patient : Two-year-old Cocker Spaniel (Male)

	1st Day	4th Day	15th Day	20th Day	27th Day	30th Day	58th Day
Colour	Dark	Pale	Pale	Pale	Normal	Normal	
Reaction	Acid	Acid	Acid	Acid	Acid	Acid	
Specific gravity ..	1035	1020	1012	1015	1015	1015	Normal
Albumen ..	+	++	+	±	±	—	in all
Bile	—	—	—	—	—	—	respects
Sugar	—	—	—	—	—	—	
Deposit	Slight casts and few R.B.C.s	More profuse	Few casts	Slight	—	—	

TABLE Ib.—SUB-ACUTE NEPHRITIS
PATIENT: TWELVE-YEAR OLD CROSS-BRED TERRIER (MALE)

	1st Day	10th Day	30th Day	60th Day	80th Day
Colour	Normal	Normal	Normal	Pale	Normal
Reaction	Acid	Acid	Acid	Acid	Acid
Specific gravity ..	1020	1015	1014	1018	1020
Albumen	+	+	±	—	±
Bile	—	—	—	—	—
Sugar	—	—	—	—	—
Deposit	Epithelial casts, few R.B.C.s	Same	Slight	—	—

TABLE Ic.—CHRONIC NEPHRITIS
PATIENT: TEN-YEAR-OLD TERRIER (MALE)

	1st Day	4th Week	5th Week	6th Week	6 Weeks and 2 Days
Colour	Watery	Watery	Watery	Watery	Watery
Reaction	Acid	Acid	Acid	Acid	Acid
Specific gravity ..	1005	1005	1005	1000	1000
Albumen	+	++	+	±	–
Bile	—	—	—	—	—
Sugar	—	—	—	—	—
Deposits	Few casts	—	—	—	—

Patient died in complete uraemia.

DIFFERENTIAL DIAGNOSIS

Differential diagnosis based on urine analysis is not clearly emphasised in the usual textbooks of veterinary medicine. In many cases, *e.g.*, in nephritis, the symptoms shown are clearly those associated with the disease, but other conditions exist in which "typical" symptoms are not apparent in the earlier stages, but in which urine analysis may reveal dysfunction of various organs. Examples are :—

(*a*) ***Skin cases*** :

(*i*) ***Eczematous type***: Both moist and dry lesions are often associated with nephritis, and respond when the renal condition is treated.

(*ii*) ***Diabetic type***: Dry skins and desquamative lesions have been encountered in diabetes mellitus. In the patient the urine analysis of which is depicted in Table II, desquamative lesions were present on the feet and legs. Those on the feet persisted for nearly a year.

TABLE II

Colour ..	Light yellow	Bile—(*a*) Pigment	+
Reaction ..	Acid	(*b*) Salts ..	—
Specific gravity	1045	Sugar	++
Albumen ..	++	Acetone	+
		Deposit ..	Few casts

The lesions on the feet persisted for nearly a year.

(*b*) ***Paraplegia syndrome.*** In such patients, nephritis and cystitis are sometimes encountered. These may be secondary to the paraplegia, but their early recognition is essential.

(*c*) ***The "rheumatoid" group.*** The stiff-necked, stiff-backed, stilted-gait type of patient, is nearly always a sufferer from sub-acute or chronic nephritis. An example is shown in Table III.

TABLE III

Colour	Pale	Bile	—
Reaction	Acid	Sugar	—
Specific gravity	1010	Deposit	Few leucocytes, pus cells and epithelial casts.
Albumen	+		

(*d*) ***Osteo-porosis or "rubber jaw."*** All the recorded cases have given evidence of anaemia and chronic nephritis. Osteo-porosis has been assumed to be associated with parathyroid disease, and it is an interesting speculation whether the endocrine or the renal factor is the primary one.

(*e*) ***Retinitis and glaucoma.*** These conditions, mostly encountered in middle-aged and old dogs, are often associated with nephritis. The eye changes in such cases are often noted by the owner long before symptoms of malaise appear.

(*f*) ***"Fits," often associated with change of temperament.*** In some such cases, even viciousness may develop. Some types of uraemic fits are not difficult to diagnose. Certain neurotic cases, in which proteinuria of the "nephrosis type" is seen, are, however, extremely difficult to determine satisfactorily. I have been able to carry out six *post-mortem* examinations on cases of this type, and in every one there have been macroscopically enlarged kidneys. In one case a fatty degeneration of the kidney parenchyma was revealed on section.

Early diagnosis of renal disease prolongs the lives of many of our canine patients, and although the prescribed treatment cannot be said to lead to "cures" it patches up the patient sufficiently to enable it to lead a comfortable life—granted the full co-operation of the owner is available.

Table IV illustrates some of the most interesting "chronic nephritics."

TABLE IV
PATIENT: THREE-YEAR-OLD COCKER SPANIEL (MALE)

1935	Four months later	Three months later	1938	1944
Colour, pale	Pale	Pale	Pale	Patient still well.
Reaction, acid	Acid	Acid	Acid	Occasional
Specific gravity, 1020	1020	1025	1025	uraemic fits.
Albumen, ++	+	±	±	
Bile, —			=	
Sugar, —				
Deposit, slight.				

PATIENT: EIGHT-YEAR-OLD CROSS-BRED TERRIER (MALE)

1936	1937	1943	
Colour, normal	Normal	Pale	Destroyed in complete
Reaction, Acid	Acid	Acid	uraemia. *Post-mortem*
Specific gravity, 1035	1025	1010	chronic nephritis.
Albumen, + ½	±	++	
Bile, Nil	—	—	
Sugar, Nil	—	—	
Deposit, epithelial casts	Slight	Few casts	

Several other patients are recorded as above, where the lease of life has been extended to several more years than formerly could have been foreseen.

TABLE V
STATISTICAL EVIDENCE OF URINE ANALYSIS IN ONE GROUP OF 157 PATIENTS (384 SPECIMENS)

I.	*Nephritis*		
	(*a*) Acute ..	24 cases ..	22 dogs, 2 bitches
	(*b*) Sub-acute ..	37 cases ..	34 dogs, 3 bitches
	(*c*) Chronic ..	42 cases ..	39 dogs, 3 bitches
I.	*Nephritis and Liver Degeneration*	5 cases ..	3 dogs, 2 bitches
III.	*Liver Degeneration*	5 cases ..	1 dog, 4 bitches
IV.	*Prostatitis—Acute*	1 case ..	1 dog. Complete obstruction. Chronic Prostatitis very common in chronic nephritis.
V.	*Neoplasia of the kidney*	1 case ..	1 dog
VI.	*Cysts of the kidney*	1 case ..	1 dog. Aged Airedale
VII.	*Nephrolithiasis*	2 cases ..	2 dogs
VIII.	*Nephritis and Secondary Cystitis*		1 dog
IX.	*Cystitis*	3 cases ..	1 dog, 2 bitches
X.	*Cystitis and Secondary Nephritis*	3 cases ..	2 dogs, 1 bitch
XI.	*Diabetes Mellitus*	4 cases ..	3 dogs, 1 bitch
XII.	*Osteo-Porosis and Chronic Nephritis*		6 dogs
XIII.	*Urethral Calculi*	4 cases ..	3 recurred
XIV.	*Cystic Calculi*	3 cases ..	1 dog, 2 bitches
XV.	*Vaginal tumours*	3 cases	

Although I have confined my attention in this paper to the dog, I would like to add a note upon urine analysis in the other small animals. Cat patients present much more difficulty than do dogs. Most of the 26 specimens I have been able to secure have been obtained at autopsy. Many have been from cases of hepatic degeneration. Some specimens obtained in life (from cats with urinary retention) have given a typical picture of cystitis. I have as yet no experience of urine analysis in the rabbit and fowl, but have encountered nephritis on *post-mortem* examination of both species.

Conclusions

As an aid to diagnosis in canine practice, urine analysis is indispensable. The subject is, however, far from worked out, and merit considerable further study.

In the course of a busy general practice, it is possible to carry out only simple qualitative estimations, but these, *properly applied*, are capable of yielding a tremendous amount of information. All the simple routine tests, and not just that for a suspected constituent, should be applied to every sample, and the results *recorded* as accurately as possible, together with clinical findings.

It is preferable to attempt to record readings on a "±," "+" "++" (and so on) basis, rather than by vague terms such as "trace." Although in the qualitative tests for protein, *e.g.*, the amount of precipitate formed in a given sample may be influenced by different conditions, and not merely by the actual amount of "albumin" in the sample, an attempt to form a semi-quantitative estimation of the amount present has been found of great value by the writer.

(*See overleaf for references and discussion*)

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Discussion

Miss J. O. Joshua opened the discussion in the following terms, her contribution being read in her absence by Miss Freak: It is unnecessary for me to congratulate Miss Uvarov on her paper; you have heard it yourselves and it speaks for itself. I can only say that she has dealt with a very wide and important subject in a masterly way—so much so, that I find myself in the awkward predicament of attempting to open a discussion whilst agreeing with the essayist in almost every way.

I do heartily endorse the view that urine analysis should be carried out by the clinician, and that full tests should always be made. Whilst agreeing that as a general rule one cannot indulge in quantitative analysis, I think there is an exception in normal times, *viz.*, the determination of blood urea. The method is simple as is the apparatus, and it does not take much time. The advantage is that to know the blood urea value in mg. per cent. gives a much truer guide to the functional efficiency of the kidney than does the test for albuminuria. This is especially true in advanced cases where, as Miss Uvarov's tables so well show, there may be no albuminuria in the last stages of nephritis. Blood urea will, however, be higher and much more definite prognosis may be given. To illustrate this point: I well remember having four aged dogs of varying types in the kennels at the Royal Veterinary College. All were clinically nephritis cases, but only in one case did we get a positive test for albuminuria. I cannot recall the blood urea figures, and as the records at the R.V.C. are apparently not available for reference I have been unable to get details. Sufficient to say that all four cases proved on *post-mortem* examination to be typical examples of canine chronic nephritis.

To add spice to the discussion, I will challenge Miss Uvarov over the nephrosis question. According to Boyd, "nephrosis" is a degenerative lesion affecting the renal tubules and not the glomeruli, being characterised clinically by massive albuminuria and marked oedema. Whilst, therefore, it may be permissible to describe a condition as nephrosis, using the above two criteria, pathologically the condition does not exist as an entity, but merely as a stage of the inflammatory cycle. This seems to me quite rational, except perhaps in those cases where toxins can be incriminated, *e.g.*, in canine distemper or in β-haemolytic streptococcal infection. Much as one may "dislike" streptococci, one has to agree with the essayist that secondary infection of the kidney is not an uncommon sequel to what we term clinically "streptococcal tonsillitis." On this point I should have been well caught out recently had I not undertaken a routine examination of a urine sample. A tonsillitis case flared up, and became clinically acute nephritis. Urine examination revealed the condition to be an acute infected cystitis, and subsequent treatment was fortunately very effective.

The albuminuria of toxaemia provide a wide and interesting field. I recall a transient albuminuria and uraemia in a dog, which died of what I have recorded elsewhere (*Vet. Rec.*, 1943, **55**, 258) as a suspected tetanus case. I think we all agree that diabetes mellitus is not common in the dog, but recently I diagnosed two cases in one week. One was a chronic "skin case" in a Yorkshire terrier male, which had a vague history of malaise. I made a lucky diagnosis by recalling a remark once made to me on the subject by Miss Uvarov, and insisted on a urine sample before treatment. The second was a ten-year-old Sealyham male, presented for destruction with absolute "textbook" symptoms. I managed to confirm the glycosuria, and have sent the pancreas, which was somewhat enlarged, for section.

I would like to ask Miss Uvarov how she diagnoses uraemic fits if there is not correlated nephritic history. I had thought that most uraemic convulsions occurred in the terminal stages of nephritis, but am wondering if latent kidney dysfunction has not been at the bottom of certain intractable cases I have seen. I should be grateful for enlightenment on this point. What factor is responsible for the fits?

Since I prepared these notes, Dr. White's paper on urinary calculi has come to hand. The reference to cystinuria is very interesting. Is there any simple test for cystine in urine? Such a test might be valuable in many ways, *e.g.*, in the prevention of recurrent calculi by keeping the urine alkaline, if this is feasible in the dog.

I hope you will now accord the paper the honour it deserves, that of a lively and interesting discussion.

Miss Uvarov: Urea excretion varied at different times of the day. Blood urea estimations involved more time than could be given in present circumstances. The form of analysis which she employed was easy and quick, and could be carried out by the busiest of practitioners. The omission of blood urea figures was counteracted to some extent by taking specific gravity determinations into account, and by performing all the qualitative tests, especially that for protein.

The nephrosis statement had met its challenge, and Boyd's definition was respected and fitted the group of conditions mentioned. Whatever the cause, the urine picture was quite *definite* and quite *different* from that in other conditions encountered. Oedema was rarely seen in canines. It might, of course, appear in the first stages of an inflammatory condition, but nephrosis in young puppies usually cleared up after a period of residual proteinuria which might go on for some months. There was so far no evidence among a group of such cases under observation that they did pass into the secondary stage.

In most cases of *true* uraemic fits, which could be seen in all stages of nephritis, the urine revealed its abnormalities in one form or another, besides which there were the clinical symptoms to assist in diagnosis. The question of hypertension should be considered, even though there appeared to be no satisfactory routine clinical method of determining blood-pressure in dogs. It was important to note that fits were frequently diagnosed erroneously as of uraemic origin (sometimes because of a proteinuria, when an incomplete urine analysis had been made), and patients were diagnosed as nephritics, when really other factors were responsible.

As a mere clinician one could say that cystinuria was not very frequently met in the dog, if microscopical examination of the urine was sufficient evidence upon which to base such a statement. In urinary deposits, cystine crystals appeared as hexagonal colourless plates of high refractivity. Several plates might appear together, or single plates might be seen. [See *addendum* to discussion.]

In some cases of nephritis, the urine might be rendered alkaline with repeated large doses of alkalis.

Miss Izard: Why was nephritis more common in the male dog, and did frequent micturition in early life lead to renal disease later? What was the cause of frequent micturition in adult dogs not suffering from renal disease?

Miss Uvarov: Endocrine factors were possibly involved in renal disease, and it was noteworthy that, excluding diseases associated with pregnancy, renal disease was probably more common in man than in woman. Considering the frequency of chronic prostatitis associated with chronic nephritis in male dogs, the endocrine assumption was at least feasible. One wondered if it was possible to have an earlier type of endocrine nephrosis leading to a chronic nephritis later on. Although nephritis was encountered in the bitch, it was her experience that the bitch was more subject to degenerative types of kidney change. None of the cases in the groups she had discussed had shown any special history of frequent micturition.

The two outstanding cases in the list were a Cocker Spaniel male, which developed sub-acute nephritis at *sixteen* years of age, and which lived for three-and-a-half years longer, the condition passing into the chronic stage, and the patient the figures from which were shown in Table IV.

Miss Izard: Did urine containing crystals dry on the slide in white patches?

Miss Uvarov: Yes. On microscopical examination the crystalline deposit made a very beautiful picture. The crystals showed up better if they were examined with the diaphragm of the microscope partly closed.

Miss Brancker, who agreed with the endocrine hypothesis, and noted that castration was beneficial in treatment of prostatic hypertrophy, recalled the following case at the request of Miss Uvarov:—

The patient was a six-weeks-old puppy with a urethral obstruction, and the urine contained an alkaline deposit. The puppy had to be operated upon on two separate occasions, and after the first operation the urine was excessively alkaline. Acid sodii phosph. was prescribed, but as the owner lived some distance away the medicine was not always replaced at the required times, and nine or ten weeks later the puppy again became obstructed. At the second operation, only a few calculi were found. Obstruction recurred once more some weeks later, but unfortunately an unprofessional person attempted to catheterise the patient without anaesthesia, and succeeded in rupturing the bladder, upon which the puppy collapsed and died. Only a few calculi were found on autopsy.

Miss C. M. Ford: She would like some information upon renal diseases in the rabbit. She had been testing rabbit urines whenever possible, and had found large quantities of protein which she suspected to be mucin. She found nephritis very common in the rabbit. In her experience, the best test when there was little protein in the urine was the sulpho-salicylic ring test.

In some cases of acute vomiting in the dog, surely the influence of excessive water intake, together with acute vomiting, might falsify the urine picture? Was it not possible to miss some of the cases of prostatitis in dogs?

She had found certain cats to be prone to recurring eczema all along the back: could this be due to renal disease? One cat which she had seen periodically over several years exhibited this type of eczema, but on *post-mortem* examination she found only an enlarged pancreas.

Was the speaker justified in laying so much stress upon the semi-quantitative test for albumin? Surely the sign "+" was a sufficient guide, even if variations did occur? She considered "+" as a small quantity and "++++" or "+++++" as a large quantity.

Miss Uvarov: Protein in urine might be of mucoid origin, but was it possible that Miss Ford might also obtain a positive test for globulin in rabbit urine? Globulin might be differentiated from albumin by having a test tube of distilled water and running a few drops of urine on to the water: in the presence of globulin a faint milky-white colour appeared, and as the urine ran down the water became "smoky."

The ring test was too fine to give a sufficiently good indication of quantity. Vomiting might affect the patient severely, but by carrying out repeated urine tests one might get a good idea of the nature of the disease. As indicated above, a 24-hour renal test, which would assist in this matter, had not yet been devised.

Acute prostatitis in the dog was not easy to miss, particularly if there was obstruction. Prostatic urine gave an interesting deposit, in which prostate cells, blood corpuscles and pus cells might be present.

Miss Holman: What was the relationship between "rubber jaw" and nephritis? How might albumin in urine be estimated quantitatively?

Miss Uvarov: There might be a negative calcium balance in nephritis. The lowered calcium content was said to induce the parathyroid hormone to be secreted in excessive amounts; this, together with the acidosis associated with the nephritis, induced decalcification of bone. Another suggestion was that osteo-porosis was due primarily to parathyroid disease, and that the nephritis was secondary.

Esbach's albuminometer might be used as a simple quantitative method of estimating protein in urine. [See *addendum* to discussion.]

Miss Freak: Were the jaw bones mostly affected in osteo-porosis, and had any of the chronic nephritis cases developed "rubber jaw" after the nephritis?

Miss Uvarov: It was true that the jaw bones were most commonly affected. In man, lesions had been seen in the long bones, but only occasionally. One of the patients had nephritis for 18 months (sub-acute passing into chronic) before developing a "rubber jaw." The animal was a cross-bred male terrier.

I answer to Miss Ford, who asked about eye lesions: Glaucoma presented little difficulty in recognition, but the ophthalmoscope was required for deeper examinations. It had been said that the term "retinitis" was a misnomer for in the early stages it was merely a retinal path, or a case of local hypertension. Oedema of the eyelids was rare, but one patient in the last stages of typical glaucoma nephritis showed oedema, especially in the mornings.

A brief survey of treatment followed.

Nephritis of the various types was dealt with under the following headings:—

(1) Regime: Rest, warmth, etc.

(2) Diet: Depending on the stage, regulating intake of fluid, exclusion of proteins, including light, easily digested foods.

(3) Medicinal: Treatment depending on the diagnosis—alkalis, vitamins, glucose, saline, etc.

Some members expressed their opinion on the use of amphotropin.

The treatment of the various conditions on the section of *differential diagnosis* based on analysis was briefly outlined, this depending on the organs affected and symptoms shown.

During the interval several members expressed their interest in the microscopical examination of deposit and the speaker emphasised its importance, particularly in such misleading cases as in vaginal lipomas and fibromas, before they were visible or palpable, and that clinically could sound rather like some stages of nephritis.

The President then proposed a vote of thanks to the essayist and said that she would look forward to reading this paper in *The Veterinary Record*.

Miss Uvarov thanked the President and the meeting for a very interesting discussion, and for the opportunity of bringing this subject to their notice. Its importance could not be over-estimated. Apart from its great usefulness, it made all the difference to general practice where all the routine cases of ears, anal glands, "Scottie" patients with skin disorders that were not even of nephritic origin, could never become monotonous, because to balance these there were the analytical cases with all their own problems and interesting developments.

It was only hoped that more time could be available to study this subject and to have the opportunity to extend analysis and record cases more, thus providing statistical evidence of its value.

Fractures in the Horse and Cow

Conspectus of Case Reports, compiled from "The Veterinary Record," 1900-1925

H. H. FROST, M.R.C.V.S.,
Wembley, Middlesex

Introduction

About 150 case reports have been drawn on in the compilation of this review, but any statistical analysis of the contents would serve very little purpose as the vast majority of the cases were reported purely as *post-mortem* curiosities, very few indeed being recorded from the point of view of possibilities of treatment. In addition to this, in many instances reports are verbose and important details are ignored.

General Observations

Os. Suffraginis (10 cases).

Mortality.—Three of the ten cases were treated with recovery. The fractures show a marked delay before union occurred.

Aetiology.—Falls after jumping were the chief cause. Also reported following neurectomy and blocking the plantar nerves for diagnostic purposes.

Type.—Mostly comminuted fractures; deferred fractures are commonly met with.

Observations on Treatment.—One method consists of slinging the horse and suspending the affected leg with a bracelet from above the carpus or hock so that the weight of the dependent lower part of the leg helps to re-align the broken fragments. This is continued for 48 hours, after which a plaster is applied. The horse is removed from slings when it is set, it being left in place for one to two months. This method of setting fractures is advocated for the setting of all bones below the hock or carpus.

Os Coronae (3 cases)

Cases not easily diagnosed without the aid of X-ray apparatus. Usually of the comminuted type.

Navicular Bone (5 cases)

Mortality.—Two out of five cases made qualified recoveries.

Site.—Transversely through the medial crest, or near to it.

This type of fracture is more commonly found first, apparently, at a *post-mortem* examination, marked symptoms being absent in life. Symptoms, when observed, resemble very closely those of acute navicular disease, arthritis of the corono-pedal joint and fracture of the os pedis. Four of one series of 25 chronic foot lamenesses showed old fractures of the navicular bone at *post-mortem* examination.

Suggested Cause.—The function of the bone is to interpose pressure between the second phalanx and the perforans tendon; it is constructed of osseous tubules running perpendicularly to the direction of greatest stress. The fracture is supposed to occur when the perforans tendon does not offer sufficient counter-thrust to the second phalanx in certain positions of the leg.

Os Pedis (8 cases)

Mortality.—Four of eight cases recovered.

Type.—A simple transverse fracture is the commonest. Misplaced nails, etc., may cause a "chip fracture," when suppuration and under-running occur until the sequestrum has been removed.

A suggested treatment for a simple transverse fracture without displacement is a temporary venous stasis of blood in the hoof by means of a tourniquet above the fetlock, followed by the application of a blister to the coronet and hoof grooving.

The Tarsus (8 cases)

Only one case was reported as being successfully treated. Of eight cases, six were fractures of the os calcis, and two were fractures of the cuneiform magnum.

The Carpus (3 cases)

A rare site of fractures, as also are the patella (one case), pisiform (one case), sesamoids (one case).

Scapula (2 cases)

True fractures of the main part of this bone are not commonly diagnosed.

The Ribs (8 cases)

The only fracture that is reported in the literature with regularity is that involving either of the first ribs. That this fracture occurs more commonly than is diagnosed is evidenced by the number of healed fractures that are noticed during the opening of carcases in the knacker yards. Ninety per cent. of cases occur in the upper third of the bone and it is close to this segment of the bone that the radial nerve lies. This renders it particularly liable to direct trauma at the time of the accident, or to permanent impairment of function after repair of the bone, owing to pressure from the callus, thus making the horse unreliable in action.

Diagnosis.—It is very difficult to diagnose a fracture at this site by palpation alone without the help of X-ray, owing to the depth of muscle encountered.

Symptoms.—Within 24 hours of fracture, if nerve damage is present, symptoms of radial paralysis will be seen. Weight can be borne passively on the limbs and the ground can be scratched with the point of the toe. There is trembling of the muscles around the scapula. If the horse is compelled to take extra weight the leg may collapse until the sternum almost rests on the ground.

There is a hollow over the triceps muscle, the leg is flexed and abducted and the toe placed forward.

Mortality.—The patient usually lives only five to seven days; after this its condition necessitates destruction.

The Humerus (8 cases)

A midshaft fracture is the commonest and is frequently accompanied by one of the scapula. When occurring only in the humerus, as often happens in foals and calves from kicks, spontaneous recovery often follows. In young bovines the accident frequently follows the habit of mounting one another and being thrown off awkwardly. It is also reported as occurring in camels in Egypt, which slip on newly tarred roads, the forelegs spread-eagling.

The Radius (6 cases)

Site.—The commonest site is in the lower third, due to kicks. Occurring commonly in young animals, treatment is well worth while attempting.

Type.—Usually a compound fracture; delayed fractures are commonly met with.

The Ulna (4 cases)

Usually occurs following a kick, the olecranon process is most frequently involved, and deferred fractures are common. Symptoms are variable and the condition is difficult to diagnose.

The Metacarpus and Metatarsus (6 cases)

Occurs commonly in fattening cattle, when splinting and amputation are worth while attempting, to avoid casualty slaughter.

A case is reported of fracture occurring in a foal *in utero*, the deformed and callused bone being a cause of dystocia.

Femur (8 cases)

Aetiology.—Apart from following inexpert casting, the chief causes are street accidents and falls.

Sites.—(*a*) Shaft, often of the comminuted type; (*b*) great trochanter. Frequently a fracture in this bone is accompanied by injury to the stifle joint, the symptoms of the latter engaging attention, the symptoms of femoral damage later making themselves evident.

Tibia (7 cases)

Commonest in calves and foals, in which recovery is the rule. Delayed fractures in older animals are common.

Bones of the Skull (8 cases)

Aetiology.—According to case reports, the most prolific source

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Addendum to Discussion [Miss Uvarov] (contributed before publication):—(1) *Cystinuria and cystine estimations*: Naturally occurring cystinuria in a family of Irish terriers has been extensively studied by Brand, Cahill and their associates in the U.S.A. (see *J. biol. Chem.*, 1940, **133**, 431–436 and earlier papers). These authors report that there were present in the cystinuric urine substances which interfered with the ordinary reactions for cystine, including the "Sullivan reaction." Some of the interference was lost on standing. In an earlier paper, dealing with human cystinuria, Brand and his colleagues (*J. biol. Chem.*, 1930, **86**, 315–331) likewise noted certain difficulties in obtaining satisfactory reactions for cystine, but recommend the following simple qualitative test, judiciously applied:—

Take 3 to 5 c.c. of urine, add 2 c.c. of a 5 per cent. solution of sodium cyanide, and allow to stand for 5 to 10 minutes. Then add a few drops of a 5 per cent. solution of sodium nitroprusside. Normal urines develop only a faint colour, while cystinuric urines give a rather stable magenta colour, which is characteristic for the SH groups.

(2) *Esbach's albuminometer and modifications*: Esbach's reagent (a solution containing 10 g. picric acid and 20 g. citric acid per litre) is added to the urine in a specially marked tube, which is then inverted to mix the contents and allowed to stand for 24 hours. The precipitate which settles out is read off against the graduations on the side of the tube.

This method is far from accurate, and is stated to yield results which vary from half to twice the true amount. More accurate results may be obtained by using an alcoholic solution of phosphotungstic acid and hydrochloric acid instead of Esbach's reagent. A further modification, which may be carried out rapidly and simply by those who possess a centrifuge, is described by Peters and Van Slyke (1932) on pp. 683–684 of their book (Quantitative Clinical Chemistry, Volume II, Methods. London: Baillière, Tindall & Cox).

of this type of fracture is the head-on collision. Hunting states[3] that the commonest sequel is a fracture of the cervical vertebrae. Fractures of the base of the skull caused by rearing over backwards are reported (two out of eight cases). They are rapidly fatal. Another rarer site of fracture is in the diastema of the upper jaw, caused through the animal gripping in its teeth the iron bar on the edge of some mangers. Unable to release itself, the animal lunges back and fracture occurs just anterior to the first premolar tooth.

Treatment.—Depressed frontal fractures are treated with variable success, depending on the amount of loose bone to be removed.

LOWER MANDIBLE (8 cases)

Of eight cases encountered, all recovered. Wiring was employed in nearly every case, the wire being left in position for a period varying from 15 to 76 days.

Exact sites are not always defined in these case reports.

Analysis :—

Separation of mandibular symphisis ...	1 case
Two incisors posterior to incisor arch ...	1 ,,
Between fifth and sixth molar teeth ...	1 ,,
Anterior to first premolar tooth	1 ,,
Just below temporo-mandibular joint ...	1 ,,

VERTEBRAL COLUMN (27 cases)

Analysis :—

Cervical vertebrae	14 cases
Thoracic vertebrae	4 ,,
Lumbar vertebrae	3 ,,
Sacrum and coccygeal	0 ,,

One case of fracture of seventh cervical and first thoracic vertebrae.

It will be seen that fractures of the cervical vertebrae are reported with far more regularity than those of any other portion of the vertebral column.

Symptoms, which are diagnostic, are sometimes mentioned in case reports, one in point being that sweating denotes the lesion being situated in either the posterior thoracic or the lumbar vertebrae, with a sharp line of demarcation of the area of sweating at the level of the suspected fracture.

Sometimes a horse with a fracture of the back will sit on its haunches like a dog or it may be able to stand if the vertebrae are only fissured. If the horse stands but is unable to step forward, the fracture should be posterior to the fourth or sixth lumbar vertebrae.

Analysis of Cervical Fractures :—

Atlas	None
Axis	4 cases
Third cervical vertebra	3 ,,
Fourth ,, ,, ...	3 ,,
Fifth ,, ,, ...	3 ,,
Sixth ,, ,, ...	2 ,,
Seventh ,, ,, ...	2 ,,

+ two cases, sites not specified.

Type.—Fractures of the cervical vertebrae are usually comminuted in type.

Mortality.—Cases of true fracture, involving damage to the spinal cord, eventually proved fatal, according to this series of cases, as compared with reports noted of vertebral luxation in the neck, which were usually reported to have made recoveries, if only incomplete.

ATLAS FRACTURE

This bone is, apparently, rarely fractured, though it should be noted that this lesion is found frequently at autopsies in a knacker yard owing to damage from the neck chain by which the carcase is loaded on to the lorry.

Aetiology.—The most prolific cause of cervical fractures is the animal becoming cast with a leg over a halter shank left too long (about 50 per cent. of all reported cases). Rearing over backwards is another cause.

AXIS FRACTURE

This bone occasionally shows a simple fracture, the odontoid process being snapped off, often following a heavy blow on the underlip.

Fracture of the fourth vertebra is usually followed by rapid death from asphyxia as the phrenic nerve is very vulnerable to concomitant damage.

FRACTURES OF THE PELVIS (23 cases)

Fractures of the pelvis seem to be *reported* when involving the shaft of the ilium, the external angle or the pubic symphysis. Fractures of the ischium and pubic symphysis are less commonly reported.

Hunting states that it is best to slaughter all cases except those involving the external angle of the ilium or the ischium. On the other hand, it would seem that some reported fractures of the pubis have made adequate recoveries.

Analysis of 23 cases

Site	Number	Fatal	Recovery
1. External angle of ilium	8	7	One incomplete.
2. Shaft of ilium ...	7	6	One incomplete.
3. Pubic symphysis ...	8	3	Three incomplete (results not stated in other reports).
4. Acetabulum	2	1	One.
5. Ischium	4	1	Two (one incomplete).

FRACTURES OF EXTERNAL ANGLE OF THE ILIUM (8 cases)

A surprising number of cases end fatally owing to laceration of the circumflex artery or vein.

Symptoms.—The quarters, when viewed from behind, are level when weight is being borne equally on the hind legs, but the affected side drops quickly when weight is taken. The fetlock is held in extreme flexion and there is quivering of the muscles in the gluteal area. These cases are difficult to diagnose by palpation, as per rectum little indication can be obtained. A hand laid on the ilium during progress will often reveal slight crepitus.

FRACTURES OF ILIAC SHAFT (7 cases)

Actual separation of the ends of the bones in this site is often delayed for some hours following the accident. Owing to the fact that the iliac artery and vein pass over the surface of the shaft, these vessels are often involved and death from haemorrhage has been known to occur. It is in treating a fracture of this type that slings are a real advantage, as in this way movement of the end of the bones is reduced to a minimum.

FRACTURES OF THE SYMPHYSIS PUBIS (8 cases)

Quite a number will unite as shown by reports of united fractures being found at *post-mortem* examination.

Symptoms.—Swelling of the parts. Adduction of the limbs. Pain on abduction. Haematuria occurs in a proportion of cases.

As a sequel, partial paralysis is seen owing to pressure from the callus on the obturator nerve.

ACETABULUM (2 cases)

In these cases the ligamentum teres is often torn and lameness of varying degrees is met with, and in some a curious position is adopted with the hind legs crossed over one another. Great pain is shown with this facture.

ISCHIUM (4 cases)

This type of fracture is not easily diagnosed in the very early stages though great swelling of the perineal region occurs within 24 hours. Swelling in this area is also seen in cases of fracture of the floor of the pelvis, the main aid to differential diagnosis being a rectal examination. Crepitus can sometimes be detected by placing the hand on the tuber ischii while the horse is in motion.

Callus formation may press on the sciatic nerve and cause problematical fluctuating lameness subsequently.

It is noted that multiple fractures are sometimes reported as *post-mortem* findings, it being observed that the fractures must have occurred at different times. Thus a fracture of the pubic symphysis may heal and be later followed by a fracture of the iliac shaft.

DISCUSSION

A perusal of the case reports at present under review brings out a notable feature in that a number of cases which began as simple lameness, later proved to have been fissure fractures to be followed at a later date by separation (delayed fractures of this kind account for at least ten cases of the series). This factor may be responsible for some of the sudden unaccountable fractures that occur.

In young animals the bones most frequently involved are the radius and tibia and treatment here would seem to be well worth while since in view of their comparatively light weight slings need not be employed. In older animals, however, the best results seem to follow slinging for the first 48 hours or so of treatment, until the plaster has hardened. In these older animals the incidence of fracture seems to be distributed over a larger number of different bones, suggesting that here a pre-existing rarefying ostitis might be an underlying cause.

A significant point that also emerges is the large number of cases of fracture in the horse that originate in the stall while the animal is unobserved (17 cases). The various circumstances in which this has occurred include the following :—

(*a*) Becoming cast with a fore or hind leg caught over a halter shank.
(*b*) Kicks from nearby horses.
(*c*) Becoming entangled in swinging bales.
(*d*) Stamping, caused by itchy legs, etc.
(*e*) The jaws becoming fixed over the iron bar of the manger

ABSTRACTS

[A Method for Preventing the Development of Strongylid Eggs in Sheep Faeces during Transport and Storage. Whitlock, H. V. (1943.) *J. Coun. sci. industr. Res.* **16**. 215-216.]

Whitlock has evolved a method for preventing the development of strongyle eggs in sheep faeces which are collected for the purpose of egg counts and require to be transported long distances involving periods of more than about 12–15 hours during transit. Tubes, which can be stored for at least two months before use, are prepared as follows: a ½ inch plug of absorbent cotton wool soaked in orthodichlorobenzene occupied the bottom of a ½ inch by 5 inch test tube; a ½ inch plug of non-absorbent cotton wool is superimposed and the tube then corked. To send samples, approximately 5 gm. faeces are added to each tube, which is then corked. Normal faeces in pellet form do not obstruct the circulation of vapour in the tube, but when they are soft they may block the tube so that eggs in the upper portion of the sample escape the action of the orthodichlorobenzene. With samples of this latter type, a passage about one-eighth inch diameter is made through the faeces by a stick or wire before the cork is inserted and this channel enables the vapour to circulate to the top of the tube. The vapour of this chemical is very effective in killing the morula, does not interfere in any way with the ability of the eggs to float when the Gordon and Whitloek counting technique is used, and does not alter the weight of the faecal sample. It was found that egg counts could be made on faeces three weeks after collection of the samples if they were kept by this method or after transport of about 1,500 miles by rail and with about 120 hours elapsing between collection and examination.

J. N. O.

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[The Relation between Rates of Growth and Rickets in Sheep on Diets Deficient in Vitamin D. Duckworth, J., Godden, W., and Thomson, W. (1943.) *J. agric. Sci.* **33**. 190-196. (Rowett Inst., Aberdeen.).]

Experiments were carried out in two successive years, commencing in November, with groups of Blackface or Half-bred wether lambs. Animals which received the basal vitamin D deficient and energy deficient diet (3 lb. turnips, 6 oz. linseed cake meal and 8 oz. chopped straw, supplying 1·6 g. Ca and 1·9 g. P, daily) alone remained in good health but did not increase in weight over the six to eight months' experimental period: their serum Ca levels fluctuated between 9 and 10 mg. per 100 ml. A group receiving the basal diet + 2·5 ml. cod-liver oil daily behaved similarly. A group which received the basal diet + maize starch to appetite, gained rapidly in weight for about three months, after which anorexia set in, its average serum Ca level fell to between 5 and 6 mg. per 100 ml., and it developed symptoms of rickets. Groups which received 50 and 25 per cent. respectively of the maize starch consumed by the previous group grew less: in the 50 per cent. group the serum Ca level fell to between 5 and 6 mg. per 100 ml., and symptoms of rickets appeared in one animal and stiffness developed in the remainder, whereas in the 25 per cent. group the serum Ca fell only to 7 to 8 mg. per cent. and general health was excellent. In groups fed (1) the basal diet + cottonseed oil to appetite or (2) the basal diet + an equal amount of cottonseed oil + 2·5 ml. cod-liver oil daily, body weight increased, serum Ca fell to between 7 and 8 mg. per 100 ml., there was no evidence of rickets, but some animals went into a comatose condition which was relieved by intravenous Ca therapy. A group which received the basal diet + maize starch to appetite + 2·5 ml. cod-liver oil daily, grew normally and remained in excellent health, with serum Ca levels fluctuating between 10 and 11 mg. per 100 ml.

Taking the experimental results as a whole, the authors conclude that (*a*) the earliest and most distinctive change in vitamin D deficiency is the serum Ca level; (*b*) rickets does not develop unless there is a moderate degree of growth and the serum Ca level is below 7 mg. per 100 ml. As judged by serum Ca levels, the lambs in these experiments appeared to have vitamin D reserves sufficient to protect them for about six weeks. It is suggested that under hill-sheep farming conditions, it may be practicable to administer massive protective doses of a vitamin D concentrate, and so avoid frequent dosing with cod-liver oil.

A. N. W.

Amongst the other causes of fracture are the following: hunting and jumping accidents, falls and accidents in the street, bolting.

References

The compilator regrets the inadequate list of references.

Vet. Rec. (1918.) p. 317.
Vet. Rec. (1904.) p. 701.
Vet. Rec. (1913.) p. 694.

[Observations on the Mineral Metabolism of Pullets. VII—The Calcium Requirement of the Laying Hen. Common, R. H. (1943.) *J. agric. Sci.* **33**. 213-220. (Queen's Univ., Belfast.).]

The calculations upon which this paper is based are taken almost entirely from previously published data, much of it by the author. It is pointed out that in Great Britain the Ca requirement of the laying fowl is usually provided in the form of a suitable calcareous grit, *e.g.*, crushed oyster shell or limestone grit, allowed *ad libitum*. This practice is endorsed. There is considerable available evidence that average percentage retention rises steeply from negative values to values in the region of 70 per cent. up to average intakes of about 0·9 g. Ca daily, and that from about 0·9 g. to 3·5 g. Ca daily retention tends to be fairly uniform in the region of slightly less than 50 per cent. It is therefore suggested that the reason why maximal Ca retention in so many metabolism experiments approximates 1 g. per day is that in these experiments the average daily Ca intake never greatly exceeds 2 g. per day. This intake is considered inadequate for sustained heavy egg production, for which an optimal daily Ca intake of 4 g. is postulated. Diets containing sufficient Ca to provide such an intake may, however, be overloaded for birds at lower levels of production, and the *ad libitum* method is therefore safer for all practical purposes.

A. N. W.

QUESTIONS IN PARLIAMENT

Animal Insemination

Mr. Granville asked the Minister of Agriculture if he is now in a position to announce the future regulations governing the experiment and practice of artificial animal insemination.

Mr. Hudson: I am sending the hon. Member a copy of a Press announcement that was issued last week in which are set out the arrangements governing the future development of artificial insemination of cattle in this country.

Colonel Carver asked the Minister of Agriculture the nature of the national service of artificial insemination offered by the Milk Marketing Board; and whether he is adopting the principle of such insemination as part of his livestock programme.

Mr. Hudson: The Milk Marketing Board has offered to organise the establishment of a number of artificial insemination centres in the interests of milk producers. These centres will be established in accordance with the principles outlined in a Press announcement issued last week, a copy of which I am sending to my hon. and gallant Friend, and the issue of licences for any such centres will be subject to consideration by a Central Advisory Committee which is being appointed for this and other purposes connected with the development of the practice of artificial insemination. As regards the second part of the Question, I hope that artificial insemination will provide one of the methods of securing improved breeding of livestock in this country.

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Colonial Office (Appointments)

Mr. Dugdale asked the Secretary of State for the Colonies if he will publish a list of all whole-time or part-time appointments which are made on his nomination from outside the Civil Service or on which he must be consulted.

Colonel Stanley: Those appointments in the Colonial Office which may be filled otherwise than through the machinery employed for the Civil Service generally fall into two classes. The first are those which require a special knowledge and experience of the different problems affecting the Colonial Empire, and which are filled by officers who have served for considerable periods in overseas territories, or who are eminent in their own fields. These include the appointments of Agricultural Adviser and his assistant, Adviser on Animal Health, Air Transport Adviser, Business Adviser, Adviser on Demography, Educational Adviser and Assistant Educational Adviser, Labour Adviser and Medical Adviser, as well as the temporary appointment held by Lord Hailey. Other appointments of a similar character may be made from outside the Civil Service. The second class is that of a number of officers of the Colonial Service who are temporarily appointed or seconded from time to time, usually for limited periods, to administrative posts in the Colonial Office. I am not sure whether my hon. Friend includes in his Question appointments to posts in the Colonial Service overseas for which I am responsible. Such appointments are fully described in recruitment pamphlets published by the Colonial Office.

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Research (Financial Assistance)

Professor A. V. Hill asked the Lord President of the Council to which of the three bodies under his direction, the Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council, should application be directed for financial assistance to research on the following sub-

jects: marine biology, freshwater biology, ecology, genetics, cytology, vital statistics, biophysics, general physiology, experimental psychology; and can such assistance be given to promote fundamental research in these fields, or is it limited to specific projects which can be shown to have practical application to industry, medicine or agriculture.

THE LORD PRESIDENT OF THE COUNCIL (Mr. ATTLEE): Where there is no indication to the contrary in a particular case, it would be appropriate to address applications in the first instance to the Agricultural Research Council if they relate to ecology, genetics (other than specifically human), or plant cytology, and to the Medical Research Council if they relate to human genetics, vital statistics, biophysics, general physiology, or experimental psychology. The Development Commission is the body responsible for recommending advances from the Development Fund for marine biology and freshwater biology in relation to the fisheries. Arrangements exist between the different bodies whereby applications can be transferred from one to the other so that they can be dealt with in the most suitable manner. The Department of Scientific and Industrial Research, the Medical Research Council and the Agricultural Research Council aid specific projects for fundamental research when further knowledge is required in the fields for which they are responsible, even if it cannot be shown that such researches have an immediate application to industry, medicine, or agriculture.

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WEEKLY WISDOM

The call comes to every man, whether his immediate duty be fighting or working or watching, not only to stiffen his resolution to endure until God gives victory, but to consecrate himself afresh to the tasks of which victory is only a condition and the beginning. —*The Times*, when announcing the invasion of France.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

July 12th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 2.30 p.m.

July 13th.—Meeting of the British Society of Animal Production, at the London School of Hygiene and Tropical Medicine, 10.30 a.m.

July 19th.—**N.V.M.A. Committee Meetings**, Royal Station Hotel, York: Finance and General Purposes, 10.30 a.m.; Appointments, 2.30 p.m.; Organising, 4 p.m.; Joint Veterinary Officers and Public Health and Parliamentary, 5.30 p.m.

July 19th.—Meeting of the Section of Comparative Medicine, Royal Society of Medicine, in association with the Institute for the Study of Animal Behaviour, 1, Wimpole Street, W.1, 2.15 for 2.30 p.m.

July 20th.—**Meeting of Council, N.V.M.A.**, Royal Station Hotel, York, 10.30 a.m.

July 21st.—Meeting of the Mid-West Division, N.V.M.A., at Bristol (Royal Hotel), 2.30 p.m.

July 25th.—Special Meeting of the Scottish Branch, N.V.M.A., at Glasgow (North British Station Hotel), 10.45 a.m.

July 28th.—Summer Meeting of the Lancashire Division, N.V.M.A., at Wilmslow, 12 noon.

July 28th.—Meeting of the Sussex Division, N.V.M.A., at Hayward's Heath (Hayworthe Hotel), 2.15 p.m.

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FUTURE MEETINGS

The Summer Meeting of the Lancashire Division on July 28th is to be held at the Imperial Chemical (Pharmaceuticals), Ltd., Veterinary Research Laboratories at Wilmslow, Cheshire, at the kind invitation of the Directors. Dr. J. R. M. Innes, Messrs. J. Francis, H. B. Parry and J. S. Steward (members of the veterinary staff of the laboratories) will describe and demonstrate the work carried out there.

A most interesting feature will be the exhibition, at the Rex Cinema, Wilmslow, of three "Animal Health" films which have been prepared for demonstration to audiences of farmers. The subjects of the films are (*a*) Tuberculosis, (*b*) Contagious Abortion, (*c*) Bovine Mastitis, and they deal with the control of these diseases and the part which can be played by the veterinary profession.

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The P.D.S.A. Bill

As the majority of our readers will be aware, The People's Dispensary for Sick Animals of the Poor recently introduced a Bill into Parliament to "incorporate and confer powers upon The People's Dispensary for Sick Animals of the Poor; and for other purposes." The reasons given by the Society for the introduction of the Bill were twofold. Firstly, to ensure that the Society would not in future be able to depart from the avowed objects for which it was started, and, secondly, to assist the Society to carry on its work in foreign countries.

The Council of the Royal College of Veterinary Surgeons decided that it could not approve of a Bill which would give Parliamentary sanction to the whole of the work of a Society which admittedly carried out the free treatment of animals of the poor without ensuring that this treatment was given under professional supervision. The Council was particularly apprehensive of a Bill becoming law which covered the "training" alleged to be given to the technical officers of the Society in order to enable them to treat the ailments of all animals of the poor. Accordingly the Council, R.C.V.S., decided to petition the Bill and this was done when the Bill was introduced at first into the House of Lords.

The Bill was referred by this House to a committee of enquiry before which the petition lodged by the Royal College was heard. Independently, the Ministry of Agriculture and Fisheries lodged a memorandum also and suggested the Bill should be either withdrawn or amended. Unfortunately, the committee of Peers were unable to see the force of these representations and they approved the preamble and clauses of the Bill, which subsequently passed its third reading in the House of Lords and was sent to the Commons.

At this stage a joint meeting of certain committees of the National Veterinary Medical Association of Great Britain and Ireland considered the Bill and decided that the Association should petition the Bill independently of the Royal College of Veterinary Surgeons in the lower House, and briefed Sir Walter Monckton to put forward the Association's case. The Bill passed its first and second readings and was referred to committee. This committee conducted an enquiry lasting four full days at which the petitions of the Royal College and the N.V.M.A. were heard. Various witnesses were called by the two professional bodies, including four members of the profession, and we are glad to say that at the end of the enquiry the committee decided that the preamble to the Bill should not be passed. This means that the Bill is now dead.

Members of the profession will be pleased to hear that this Bill has been defeated and will hope that the Minister will shortly be in a position to announce the formation of his committee to enquire into unqualified practice. They would wish us to express, on their behalf, grateful thanks to those members who worked so hard and carefully to prepare and put the case for the profession.

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Roll of Honour

PILOT OFFICER D. L. A. POOL

It is with deep regret that we learn from the Royal Air Force casualty list published on June 29th, that Pilot Officer Douglas L. A. Pool, elder son of Mr. W. A. Pool, M.R.C.V.S., of the Imperial Bureau of Animal Health, and Mrs. Pool, of Effingham Road, Surbiton, previously reported missing, is now presumed to have been killed in action.

In our issue of November 13th we recorded the announcement that Douglas Pool, Wireless Operator/Air Gunner, was missing from air operations over enemy territory in July. He was not only a keen and able Officer, but a young man of most pleasing personality, and the deepest sympathy of members of the profession and their other many friends will go out to the bereaved parents and to the younger brother, also serving with the R.A.F.

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R.C.V.S. OBITUARY

MERCIECA, Tancred, 89, Howard Street, Sliema, Malta. Graduated Edinburgh, May 20th, 1908. Died January 24th, 1944, aged 64 years.

THE LATE MR. TANCRED MERCIECA, M.R.C.V.S.

Mr. Tancred Mercieca, whose death we record above with much regret, after undergoing a preparatory course in medicine, was selected in 1903 for a course at the Royal (Dick) Veterinary College.

In the year in which he qualified, Mr. Mercieca was appointed as veterinary surgeon with the Corporation of Glasgow, but very shortly after he secured appointment as Assistant G.V.S. in Malta becoming P.G.V.S. in 1933. He retained this position until his retirement in 1943; including a period in 1938 when he served as Acting Director of Agriculture, Malta, which position he was obliged to relinquish on account of ill health.

Mr. R. W. CROWTHER, B.SC., M.R.C.V.S., to whom we are indebted for the foregoing particulars, extracted from a tribute in a local paper in Malta, adds: "Mr. Mercieca possessed a very quiet and likeable personality which endeared him to all those who were fortunate enough to know him.

"I feel certain that his loss will be felt both in Malta, and also by many old friends in the United Kingdom."

PERSONAL

Retirement of Mr. Arthur Gofton

Mr. Arthur Gofton, F.R.C.V.S., Chief Veterinary Officer to the City of Edinburgh, retires from that post on July 15th, after service with the Corporation for 30 years, and *The Scotsman* records that at a meeting of the Public Health Committee of Edinburgh Corporation, Councillor John Cunningham, convener of the Committee, paid tribute to Mr. Gofton for his valued service over a long period of years.

Mr. Gofton, who was born in 1878, reached the retiring age limit in October last, and at the request of the Committee he agreed to continue his services until this summer. In 1905 he was appointed Professor of Medicine in the Royal (Dick) Veterinary College, a post which he occupied until 1915, when he was chosen as Chief Veterinary Officer of the new veterinary department set up by the Corporation of Edinburgh.

Mr. Gofton has held many distinguished posts in the veterinary profession. He took a strenuous part in the reorganisation of the National Veterinary Medical Association of Great Britain and Ireland, of which he was President in 1924-25. In 1934 he was elected an honorary member of the Association. He was Vice-President of the Royal College of Veterinary Surgeons from 1926 to 1928, and member of the Scottish Board of Research in Veterinary Science.

Mr. Gofton served during the South African War in connection with the sea transport of horses in 1901, and he also served in the last war, from 1916 to 1918, holding a temporary commission in the R.A.V.C., and was mentioned in dispatches.

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Births.—Anderson.—At 71, Great King Street, Edinburgh, on June 22nd, to Ruth (*née* Linday), wife of William R. Anderson, M.R.C.V.S., of Corstorphine and Ratho, a son.

Beaumont.—On June 27th, 1944, at the Hereford General Hospital, to Joan (*née* Barker), wife of Capt. G. L. Beaumont, R.A.V.C.—a daughter.

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Mr. Max Henry.—With the distinction of having been largely responsible for the formation of the Australian Veterinary Association in 1921, the first Honorary Secretary and the first editor of the *Australian Veterinary Journal*, it is fitting that Mr. Max Henry, D.S.O., B.V.Sc., M.R.C.V.S., Chief of the Division of Animal Industry, N.S.W., should have the honour of being the first member to be elected as President for the second time.

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Animal Diseases Research Association: Moredun Institute Appointments.—Mr. A. W. Taylor, Ph.D., M.R.C.V.S., who has been a member of the staff of the Institute since 1934, is about to take up a post with the Colonial Office, and the staff has been strengthened by the appointment of Mr. Angus Foggie, B.Sc., M.R.C.V.S., Mr. Daniel Slavin, M.R.C.V.S., and Miss Margaret Cooper, M.R.C.V.S.

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Will.—Mr. William Edward Livock, of Westfield House, The Links, Newmarket, veterinary surgeon and racing and breeding manager for Mr. J. V. Rank, left £17,795 gross (net personalty £17,325).

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RE-OPENING OF ADMISSION TO THE ATTESTED HERDS SCHEME

The Minister of Agriculture announced in the House of Commons on May 19th that he proposed to re-open admission to the Attested Herds Scheme, very shortly, to all types of herd, without financial assistance towards the cost of qualifying tests and without bonus payments, but that these conditions would not affect herds already in the scheme. It is now announced that arrangements have been made to re-open admission to the scheme on this basis forthwith. Applicants will be required (*a*) to satisfy the Minister that the management of the herd and the conditions in which it is kept are suitable for the observance of the rules applicable to attested herds, and (*b*) to produce certificates of two consecutive tuberculin tests of the herd carried out at an interval of not less than 60 days and not more than 12 months between the tests, and at which no reactor was found. If these requirements are satisfactorily met, an official test of the herd will be carried out, without cost to the owner, with a view to the issue of a certificate of attestation.

In the case of a new herd being constituted by animals transferred from attested herds, the Minister will be prepared to consider the issue of a certificate of attestation at once without further test.

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EFFICIENCY IN MILK PRODUCTION

Many factors involved in efficient milk production were dealt with by Sir Thomas Baxter, Chairman, at the recently held annual meeting of the Milk Marketing Board. The quantity of milk sold through the Board last year (said Sir Thomas) was greater than in any previous year since the Board was formed. For this great achievement producers were entitled to the gratitude of the nation. Milk remained priority number one in the farming programme, and producers had been responding well to the Ministry of Agriculture's appeal for still more milk. Not all of the increase in production had been passed on to the consumer in the form of liquid milk. The restriction in supplies, particularly in the winter months, was continued, but the additional milk available had been used, in accordance with the policy of the Ministry of Food, in the manufacture of milk products.

The section on prices embodied this reference to the war-time milk production bonus, to continue until March, 1945: "We are glad that the Minister has recognised, in this substantial way, the special problems and difficulties of the small dairy farmers in war-time. The majority of our producers are small, and I think we all appreciate how well they have maintained, and even increased, supplies in war-time. I believe the bonus now paid will assist in maintaining this increase and stimulating confidence. The Board are satisfied that the price increase and the war-time milk production bonus together are sufficient to meet the increases in costs arising during the last year, and that the level of milk prices now—particularly in the winter months—should enable all efficient producers to get a fair return."

National Milk Records

"I mentioned in my statement last year," proceeded the Chairman, following a statement on transport, "that we had undertaken the administration of milk recording in this country under the national milk records scheme. The scheme has grown rapidly, and now we have nearly 10,000 members under the senior and 4,500 under the junior scheme—a total of 14,500 recording producers compared with about 4,000 eighteen months ago. This has involved a great deal of work and a real strain on our limited staff resources in war-time. We have strengthened the administration of recording in many ways, and considerable progress has been made, but we are still only at the beginning in this work of organising recording in our dairy herds. We shall endeavour to increase membership of national milk records and improve the service continuously, because we are convinced that milk recording, already too long neglected in this country, is an essential part of efficient milk production.

"But this is the first stage only, and is obviously a preliminary to using the records in improving the breeding of livestock. During the year some part of the Government's policy to improve the quality of the nation's milk supply has been put into operation. The development of production of T.T. milk is encouraged by the higher price of 4d. per gallon which is now being paid to producers of this quality milk. I would again repeat the advice I have given to producers on other occasions to shape their plans to produce T.T. milk. I am hoping that the Ministry of Food will be able to adjust their arrangements for supplies sufficiently to enable consumers who require this quality milk to get it without difficulty.

"Producer-retailers will be affected on the distributive side of their business as soon as the Minister introduces regulations restricting the sale of untreated milk in certain specified areas. Unless the milk delivered by producer-retailers to customers is either T.T. or accredited from a single herd it will have to be heat treated before it is sold. I understand that the Ministry are taking the necessary steps through the dairy trade to facilitate the installation of adequate heat treatment plant."

Artificial Insemination

"More recently we have been impressed with the possibility of artificial insemination in the improvement of the herds in this country," Sir Thomas Baxter continued. "Although artificial insemination is a new technique it is not untried in this country, and it can bring about a rapid improvement in the breeding of livestock. The great majority of the cows in this country are maintained for milk production, and we consider it our duty to offer to assist in the development of artificial insemination on behalf of dairy farmers. We have therefore offered to the Ministry of Agriculture to provide a national service* and I am confident that we have the support of our producers in this proposal. I hope that we shall soon be setting up the first stations. We realise that the development of artificial insemination will give us many difficult problems, but we shall be guided by the Ministry's Advisory Committee, which will be representative of all livestock interest. I am personally very impressed with the possibility of artificial insemination improving the herds of the small producers, who are obviously unable to obtain the best bulls. This seems to me another way by which the small men can get advantages in production equal to those of the large scale producer."

* A Government announcement on the setting up of such a national service was reproduced in our issue of July 1st.

Raising Standards

The Chairman concluded: "I am convinced that the place of milk in the national diet is going to be more important after the war than it has been even in war-time. More milk will be required. The Minister is already telling us of plans for production of much more winter milk in the next few years. He is also telling us that we must gain efficiency. I do not take this reference to efficiency as a criticism of our performance in war-time—I think this, by common agreement, is a fine one barely equalled, let alone excelled, by any other section of the community. But in building up our industry in the future I am sure we must improve the efficiency of milk production. Our output per cow and per man engaged must be higher—we cannot just add increasing cost of labour on to the price of milk. Before long I believe the market for milk will once again become the responsibility of producers, and high costs, which mean high prices, will be disastrous.

"We must make up our minds, in spite of difficulties, to become the most efficient dairy farming industry in the world in both quality and quantity. Milk which is ungraded is not going to be good enough. Cows which are not healthy must be eliminated; buildings which are not suitable must be made suitable; water supplies must be provided. We must raise our standards of efficiency and service as an industry.

"We must also pay much more attention in future to research and investigation into the many technical problems of production and marketing, and to the practical application on the farm of the results of this research. Milk is our main farm product in this country and one of vital importance in the proper nutrition of our people. The resources used now in research are far too limited, and it is in the interest of producers themselves that the scale of research and the technical training of personnel should be increased substantially as soon as the war is over. The Board will give consideration to this in order to find by which means we can be of the greatest assistance to the industry."

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Compulsory Heat Treatment of Milk

Schemes for the compulsory heat treatment of milk have been reaching the Ministry of Food steadily from December onwards, but so far none seems to have received official approval. Lord Woolton, when Minister of Food, expressed the hope that the whole of these schemes would be in operation by the end of this year.

One factor believed to be responsible for the delay in going ahead with the schemes that have been prepared is shortage of pasteurisation plant, suitable buildings in which to house it, and lack of assurance that adequate skilled labour will be available at all times to operate the plant.

Another factor is that no agreement has yet been reached between the Ministry and the distributive trade on the question of a special allowance to cover the cost of heat treatment, which is approximately ½d. per gallon.—*Farmer and Stock-Breeder.*

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Ministry of Agriculture News Service

Sheep Maggot Fly.—Investigational work on this pest has been carried out for a number of years by staff of the University College of North Wales, Bangor, with the aid of grants from the Agricultural Research Council. In addition to work on dipping and dusting as preventives, the Australian practice of "crutching"—the close clipping of the tail, crutch and hindquarters—has been investigated as a measure of control.

Tail infestation is most common, and experimental work over a period of three years has shown that, of 334 crutched lambs, only three were so infested, while 61 uncrutched lambs out of 480 were affected—a proportion of more than 12 to 1 in favour of the crutched animals. It is not claimed that crutching is an absolute preventive, as it will be seen that some crutched lambs become infested after scouring. The proportion is, however, so much lower than in uncrutched lambs that the practice can be recommended with confidence, as a control measure for all sheep in conjunction with, rather than as an alternative to, dipping or dusting. The investigations covered a number of farms carrying different breeds and with various conditions of management, grazing and treatment for maggot.

"Crutching" is sometimes subjected to three criticisms—unsightliness, time involved and loss of wool. The first can be prevented by rounding off the clipping. The second is almost negligible, being about two minutes with hand shears and 1 to 1½ minutes with mechanical shears. Moreover, the time spent on clipping will be more than offset by time saved in treating a considerably smaller number of infested animals. The third—loss of wool—is not well founded.

Lambs should be crutched at shearing, but it is recommended that ewes and other sheep should be done about four to five weeks beforehand. The crutched animal will be barely distinguishable from the uncrutched after about three weeks. In addition, the clippings taken at crutching will have a higher value than dirty wool taken at shearing from an infested spot.

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Milk Cooling.—Milk cooling is important at all times of the year—in summer it is vital. Legislation requires milk to be cooled to within 5° F. of the temperature of the water used. Attention to details when cooling makes it possible to lower the temperature to within 3° of the available water. Large surface coolers are best, for they are able to deal with a greater volume of milk and so cut down the time lag between actual milking and cooling. Best results are always obtained when the cooler can keep pace with the milk-pail. Milk should go from pail to cooler direct, not via a standing churn and thence to cooler. See that the cooler's water is running in the right direction, that is from bottom to top, not from top to bottom. When commencing to cool turn on main water tap to its full, but open cooler tap slowly. Allow water to flow for a few minutes before tipping in milk. Make sure the cooler is level. A slight deviation from the horizontal will cause uneven distribution of milk.

Churns for receiving milk from the cooler must be kept in a cool place. It is of little use lowering the temperature of milk only to raise it again in a sun warmed churn. When filled, stand churns in the shade, if possible in a draught. Should a cool running brook or stream be available, place the churns in the water, making sure that the level of the water is the same as that of the milk in the churn. If the stream is too shallow, deepen a portion. If milk has to await collection on a loading platform, see that this is built on the shady side of the road and has some form of sun protection.

CORRESPONDENCE

The Editor will be glad to receive items of professional interest for inclusion in these columns.

The views expressed in letters addressed to the Editor represent the personal views of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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LISTER'S DOCTRINE IN ANIMAL SURGERY

Sir,—Your excellent comment (*Vet Rec.*, March 18th, 1944, p. 98) relating to our brief sketch on the long disobedience to Lister's teachings in the practice of veterinary surgery (*J.A.V.M.A.*, Dec. 1943, p. 378) calls for our explanation of "Listerism" by which was meant the original doctrine of Sir Joseph Lister independent of the details of its application brought about through the years by advancements in the sciences concerned. We nod assent to your view that actual laboratory training would improve the techniques of the surgeon. It would give a better sense of contact with the microbes Sir Joseph strove to shoo away with his historic phenicated cloud. Obviously surgeons, especially veterinary surgeons, have lacked that sense in a much greater degree than contemporary laboratory technicians. But, declaring Listerism obsolete seems like unfair treatment of a famous teaching. Changes in methods have never made a dint in the principle involved. Better to confess that Sir Joseph sent the laboratory technicians on a chase for causes they had not dreamed of. Admitted, Pasteur and Koch and Lister were not bacteriologists. Yet, their teachings were never successfully debunked.

As to Listerism, the orthodox notion that asepsis has superseded antisepsis is largely academic. Whether physical or chemical agents are used, they are but a means to the same end—the end conceived by Sir Joseph Lister. The modern ways of making surgical *matériel* safe, including conditioning the air of the surgery, are as "antiseptic" as Lister's carbolic acid in the broad sense of the term. Nothing in method or material used in the modern surgical operation discredits the original Listerian doctrine. Quite the contrary, recent discoveries of sensationally effective antiseptics more closely focus attention to the primitive hypothesis—the killing of germs with chemicals.

In short, "Listerism as enunciated by its original exponent, is now obsolete," may not be universally accepted as true. How much of the advancement of the biological sciences related to medicine is owed to Lister's premonition is not measurable but it does seem more than coincidental that microbiology went forward with long and rapid strides immediately thereafter. In fact, "keep germs out of wounds" was an idea of such striking result that it started a new era of medicine. Although we agree that "there are still easily discernible wide and numerous lacunae" to be filled up in our work, in this "neck of the woods" we like to think of Listerism as very much alive, not obsolete because its application has been improved.

Yours faithfully,

L. A. Merillat, *Editor*,
A.V.M.A. Publications.

Chicago, Ill.
May 21st, 1944.